Topics in Primary Care Medicine

Management of Marine Stings and Scrapes

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"Topics in Primary Care Medicine" presents articles on common diagnostic or therapeutic problems encountered in primary care practice. Physicians interested in contributing to the series are encouraged to contact the series' editors.

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As more people swim, snorkel, and scuba dive, the need has increased for primary care providers to be able to recognize and treat marine bites and stings. In this article we review the more common marine animals that can pose a threat to humans: the Portuguese man-of-war, jellyfish, sea anemones, sponges, sea urchins, stingrays, corals, catfish, and lionfish (Figure 1). Our focus will be on symptoms and the initial management of these envenomations.

Portuguese Man-of-War, Jellyfish, and Sea Anemones

Having in common a similar stinging cell, the Portuguese man-of-war, the true jellyfish, the box jellyfish, and the sea anemone are among the major sources of marine envenomation today. The Portuguese man-of-war inhabits the warmer waters of the Atlantic and can often be found off the Florida coast or in the Gulf of Mexico. Its smaller Pacific counterpart, the bluebottle, accounts for many marine stings in Hawaiian waters. Numerous species of true jellyfish can be found throughout all waters along the United States' coastline. The box jellyfish may well be the most poisonous animal in all marine life and is found primarily off the coast of Queensland, Australia, or in the open seas of the Indo-Pacific. The sea anemone is commonly found in tidal pools and induces its sting when the unsuspecting victim brushes against it. Like the man-of-war and the jellyfish family, the sea anemone contains stinging nematocysts.

The nematocyst is a cell containing venomous fluid within which is a threadlike projection. Once the nematocyst is stimulated, this needlelike tube lashes out, releasing its venom into a victim and inflicting a sting that can lead to both local and systemic reactions. The venom contains many polypeptides, quaternary ammonium compounds, histamine, 5-hydroxytryptamine, and catecholamines.

Some jellyfish tentacles reach 40 meters in length, are often transparent, and pose a significant hazard to unwary swimmers. Man-of-war tentacles can each contain as many as 750,000 stinging nematocysts. A dead man-of-war on the beach or any broken tentacles can retain live nematocysts able to sting for several days.

The severity of the sting of a Portuguese man-of-war, jellyfish, or anemone depends on several factors: the animal involved, the amount of venom and the nature of its toxicity, the size of the sting over the surface area of the victim, and the victim's general health. Mild stings generally produce a localized reaction, with the victim initially experiencing burning sensations and paresthesia at the site of envenomation. Pain may radiate throughout a given limb into the groin or axilla. Pruritus and localized erythema often develop at the site of tentacular imprinting. Wheals and a papular dermatitis can erupt within the first several hours and remain for as long as a week. Sea anemone and selected jellyfish stings can often progress to skin necrosis with ulcerations.

A Portuguese man-of-war encounter may lead to a discharge of hundreds of thousands of nematocysts in a single sting, occasionally leading to significant systemic reactions but rarely resulting in fatalities. Severe man-of-war, jellyfish, and anemone stings can produce neurologic sequelae ranging from malaise and headache to seizures, delirium, coma, and paralysis. From a cardiopulmonary standpoint, cardiac arrhythmias, bronchospasm, laryngeal edema, and respiratory failure can develop. Gastrointestinal complaints include nausea and vomiting. Victims may complain of severe musculoskeletal spasm and cramping.

Box jellyfish stings, which contain a cardiotoxin, are often lethal: 15% to 20% of box jellyfish stings prove to be fatal; death can occur in less than 30 seconds.

Treatment modalities are described in Table 1. For treating a person stung by a jellyfish or a Portuguese man-of-war, the affected site should be immediately bathed in seawater if a detoxicant is not readily available. Applying fresh water can induce further toxin discharge and stinging, with worsening of symptoms. Definitive care of the sting is directed at methods that inactivate the toxin and remove the tentacles.

Applying vinegar (5% acetic acid) is now the treatment of

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choice to inactivate nematocyst discharge of most species of jellyfish, the Portuguese man-of-war, and sea anemone. Baking soda is the suggested first line of therapy for Chesapeake Bay sea nettle stings. The wound site is then washed clean, and the detoxicant may be reapplied if necessary. In a pinch, a paste of baking soda may be applied and removed by scraping the area with a knife or shell edge. Tentacle fragments adhering to the skin should be removed with any available instrument but are best dislodged by using a razor for shaving. Direct physical contact by the rescuer should be avoided. The site of the sting should not be rubbed.

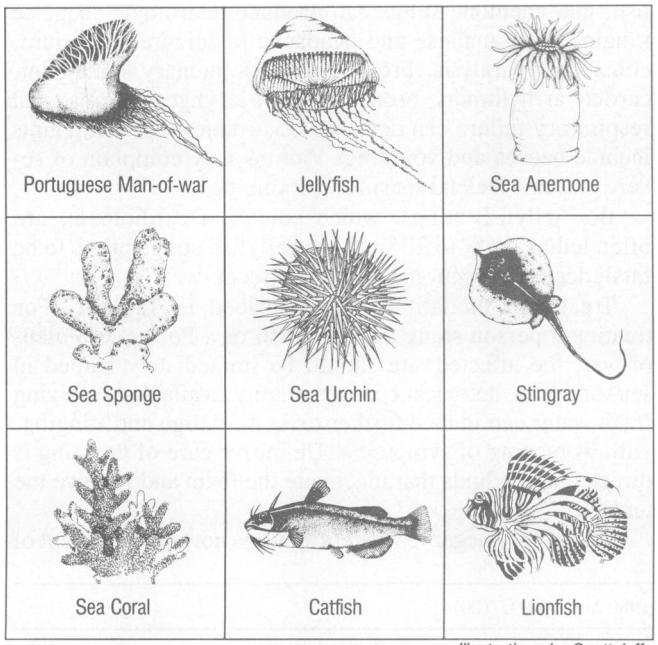
Alcohol has been a treatment modality used in the past; recent studies indicate, however, that its use can lead to substantial nematocyst discharge in vitro. Many other agents, including dilute ammonia and aluminum sulfate, have also been used with variable success. The use of papain, found in meat tenderizers and which purportedly cleaves the toxin proteins, is viewed with skepticism by some authorities.

After the nematocysts have been inactivated and removed, additional supportive measures can be addressed. General use of prophylactic antibiotics is not recommended. Oral analgesics are given for pain relief; occasionally, parenteral agents are necessary. Administering antihistamines and epinephrine can effectively treat allergic phenomena. Other topical medications, such as local steroid creams or anesthetics, may resolve local discomfort. Daily soaks with Burow's solution may be helpful. Some experts advocate tetanus prophylaxis. Occasionally severe systemic reactions develop, and supportive care is directed at specific symptoms as transportation to the nearest hospital or care center is arranged. There are no specific antivenoms available for treating North American jellyfish, Portuguese man-of-war, or sea anemone stings; however, there is a specific antidote for the deadly box jellyfish sting.

In the event of a box jellyfish envenomation, antivenom, obtained through hyperimmunizing sheep, may be given parenterally, preferably intravenously. Ampules containing 20,000 units of antivenom and available through Commonwealth Serum Laboratories, Melbourne, Australia, may be administered intravenously over five minutes. The antivenom diminishes the localized reactions produced by the box jellyfish, as well as the more severe systemic effects. Some experts also recommend applying a proximal venous occluding tourniquet in addition to giving the antivenom.

TABLE 1.—*Treatment of North American Jellyfish and Portuguese Man-of-War Stings*

Bathe site in seawater
Apply 5% acetic acid (vinegar)
For the Chesapeake Bay sea nettle, apply a baking soda slurry
Remove tentacles with a razor blade or other instrument
Use analgesics for pain relief
Soak daily in Burow's solution for comfort
Consider giving topical corticosteroids



Illustrations by Scott Jeffs

Figure 1.—The various marine animals are depicted that can inflict wounds, bites, or stings on unwary swimmers, snorkelers, or scuba divers.

Corals

The true corals do not sting their victims but cause direct trauma through the development of "coral cuts." These warm water organisms, structured on a skeleton of calcium carbonate, are responsible for the development of coral reefs, which are often explored by divers and snorkelers. As the victim brushes against the reefs, the knifelike coral can produce sharp cuts, with pruritus, erythema, and urticaria developing at the wound site. Cellulitis with ulceration can occur, leading to necrosis. These lacerations heal slowly, with the victim often experiencing prolonged localized discomfort. This may be due to bacterial infection, contamination of the wound site with microparticles of coral or sediment, or possibly to toxin effects.

Coral cuts are primarily treated with irrigation and debridement. The site of abrasion or laceration should be cleansed with soap and water. Irrigating with a saline solution is important to remove any foreign material and to prevent secondary infection or the development of a foreign body granuloma. Hydrogen peroxide has also been used as a means of removing small coral particles from the wound site. Wounds are subsequently treated with wet to dry dressings using topical antiseptic solutions. While further well-designed clinical studies are needed, current recommendations regarding antibiotic therapy for coral cuts suggest that patients with normal immune states probably require no prophylaxis. Patients who have a compromised immune system should receive a combination product of trimethoprim and sulfamethoxazole, ciprofloxacin, or tetracycline to cover marine infections due to such organisms as *Vibrio* or *Aeromonas* species.

Sponges

Sponges inhabit the sea bottom and pose a danger to divers and snorkelers. Sponges are capable of producing both an irritant dermatitis and a contact dermatitis. Sponge irritant dermatitis appears to be due to the sponge spicules, which can become embedded in the host victim. Sponge contact dermatitis, produced by a yet-undefined toxin, leads to local reactions similar to those seen with poison oak. Erythema, pruritus, and vesicles develop with weeping lesions, occasionally leading to desquamation. Local joint swelling and stiffening can occur. Erythema multiforme and anaphylaxis may be a rare complication. The fire sponge,

found in the Florida Keys and Hawaii, often produces a contact dermatitis.

Contact with a sponge may lead to elements of both kinds of dermatitis, and treatment should be initiated accordingly. To prevent the irritant dermatitis, spicules should be removed with adhesive tape and the area bathed in vinegar. The immediate management of sponge contact dermatitis includes immersing the wound site in a vinegar solution. Later therapy relies on the use of local steroid creams and lotions. Systemic steroid therapy may be necessary for severe reactions.

Sea Urchins

Sea urchins are small, nonaggressive animals found on beaches, hiding in coral reefs, or along the ocean bottom. Sea urchin spines are of two types: they may be dangerously sharp, hollow, and toxin-containing, or they may be short, blunt-edged, and nonvenomous. Some species of urchins may have venomous, triple-jawed pincers capable of envenoming and adhering to the victim. Sea urchin venom contains serotonin, steroid glycosides, and acetylcholine-like agents. With direct contact, spines of the urchin can rapidly embed in a victim, producing severe burning dysesthesia with swelling. The envenoming triple-jawed pincers tend to produce more systemic reactions than the sharp, venom-containing spines, leading to edema and hemorrhage at the wound site, paresthesias, paralysis, respiratory failure, and, in rare cases, fatality.

The treatment of wounds due to encounters with sea urchins is primarily of a supportive nature. Bathing the area in hot water to tolerance can help to alleviate the pain. It is important to remove any attached pincerlike organs, as they can continue to envenom the victim when torn from the sea urchin shell. Experts agree that removing the thick calcium carbonate spines is warranted, as these may produce foreign-body granulomas and secondary infections. If easily accessible, smaller, thin, venomous spines can be removed but should otherwise be left to become resorbed. Extracting the spines is not easy, as they can fractionate in the skin. A purplish discoloration of the skin may develop due to the sea urchin dye. Surgical removal of spines using an operative microscope is necessary in instances where spines have lodged in a joint or near a nerve. X-ray films may be helpful in locating spines in the soft tissue. Antibiotic therapy is similar to that for coral cuts.

Stingrays

Stingrays account for hundreds of marine envenomations yearly in the United States. Preferring shallow, warm waters, stingrays common to North America inhabit inlets, reef areas, and river mouths, as well as fresh or brackish water. When an unwitting bather steps on the fish, the stingray reflexly lashes out its tail, on which it carries its stinging spine, and buries the barb into its victim's skin. The spine contains retroserrate teeth and grooves holding venomous glands and is surrounded by an integumentary sheath. The stingray causes a puncture or jagged laceration with its stinger as it releases venom into a victim. Both trauma and envenomation play a role in a stingray wound, and because the wound site contains the stinger as well as pieces of the integumentary sheath, secondary infections are common.

Stingray wounds are most often found on the lower extremities but are occasionally reported on the abdomen and thorax. A patient will initially experience a localized burning pain that peaks in a few hours, resolving over a two-day period. There is localized swelling and bleeding; the sting site ultimately becomes reddened and hemorrhagic. Stingray venom contains 5′-nucleotidase, serotonin, and phosphodiesterase, which cause such systemic reactions as severe muscle cramps, nausea, vomiting, diaphoresis, tachycardia, and cardiac arrhythmias with hypotension, loss of consciousness, and, rarely, death.

TABLE 2.—*Treatment of Stingray Injuries*

Irrigate with normal saline solution, fresh or sea water
Transport to a local care center
Immerse in hot water (45°C to 50°C) for 90 minutes
Debride
Use analgesics for pain relief
Use prophylactic antibiotics
Administer tetanus prophylaxis

Treatment should be initiated as described in Table 2. Stingray injuries should be promptly irrigated; if a normal saline solution or fresh water is not readily available, seawater is an effective alternative to help remove the venom. Stingray wounds can be serious and life-threatening and generally require evaluation at a health care center. Some authorities recommend that, in cases where envenomation is severe and transportation to a local medical facility is delayed, consideration be given to using a proximal lymphatic occlusive bandage. Hot-water immersion at 45°C to 50°C (113°F to 122°F) for 90 minutes should be initiated as soon as feasible; this therapy will inactivate many heat-labile marine toxins and provide local relief. Many authorities report that effective analgesia can be attained with the administration of local anesthetics without vasoconstrictors. The wound should be explored and debrided, with removal of all remnants of the spine and integumentary sheath. Extremity wounds should be elevated. Large abdominal or thoracic cavity wounds require surgical exploration and evaluation. Wound sites may be left packed open or closed loosely with effective drainage. There is anecdotally a high incidence of secondary infection. Although prophylactic antibiotic use remains controversial, most authorities recommend prophylaxis. Appropriate aerobic and anaerobic cultures of all infected wound sites should be done. The initial empiric antibiotic recommendations are directed at treating such organisms as *Vibrio, Alteromonas,* and *Aeromonas* species, with the use of agents such as trimethoprim-sulfamethoxazole, aminoglycoside antibiotics, or ceftazidime until culture and sensitivity results are known. Tetanus prophylaxis should be administered.

Catfish

Catfish, which are found in both fresh and salt waters of North America, puncture and sting victims with sharp spines on their dorsal and pectoral fins. Pain is immediate and often intense, although usually less severe than that induced by stingrays. Initially a victim experiences sharp, shooting dysesthesia at the wound site, with pain extending through the length of the involved extremity. Tissue ischemia can follow, with cyanosis, swelling, and peripheral erythema developing later. Muscle spasms can occur, but severe systemic reactions, including peripheral neuropathy, hypotension, and loss of consciousness, are uncommon.

Most catfish stings occur on the upper extremity when the fish is handled incorrectly; fishers are often victims. It is advisable for persons catching catfish to handle the fish with heavy gloves or a towel. The treatment of a catfish sting is similar to that for a stingray envenomation, with irrigation, cleansing, and the use of hot-water immersion. Systemic symptoms tend to be less pronounced with catfish venom.

Lionfish, Scorpion Fish, and Stonefish

The lionfish, scorpion fish, and stonefish all have in common the ability to envenom using the spines of their dorsal, pectoral, and anal fins. These fish are noted for camouflage and inhabit the Florida Keys, the Gulf of Mexico, Hawaii, and the southern California coast. The lionfish is regularly imported from the Philippines into the United States for purchase by tropical aquarium enthusiasts. Even when dead, this fish can retain active venom for as long as 48 hours and be a source of danger to handlers.

The severity of stings depends on the envenoming species, with the stonefish being the most venomous. The pain of an envenomation with all three of these fish is throbbing and intense, with pallor initially at the puncture wound site, followed by cyanosis and swelling. Systemic symptoms include gastrointestinal discomfort with nausea, vomiting, and diarrhea; neurologic complications with seizures, paralysis, neuropathy, and delirium; and cardiovascular effects with arrhythmias, hypertension or hypotension, congestive heart failure, and death. Secondary infections can occur.

The treatment of envenomating stings is similar to that of stingray stings, using hot-water immersion, irrigation, and wound cleansing. Tetanus prophylaxis is indicated. For severe stonefish envenomations, an antivenom is manufactured by Commonwealth Serum Laboratories of Melbourne, Australia, and is available through San Diego's Sea World, San Francisco's Steinhart Aquarium, or at Sea World of Ohio. This antivenom can be used for stings due to other members of the scorpion fish family but is usually unnecessary with these milder stings.

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